Claim 18 (amended, clean version)

The optical apparatus of claim 14 further comprising an alignment-adjusting element for adjusting an alignment between said spectral channels and said micromirrors.

REMARKS

The Examiner rejected claims 13 and 18 under 35 U.S.C. §112, second paragraph. Applicants have amended these claims in accordance with the Examiner's comments and respectfully assert that these rejections have now been overcome.

The Examiner allowed claims 23 – 46. Applicants respectfully accept this allowance. The Examiner further indicated that claims 7-9, 13-18, and 21-22 would be allowable if rewritten in independent form with certain informalities corrected. The Examiner rejected claims 1-4, 12, and 47-51 under 35 U.S.C. §103(a), as being unpatentable over U.S. Patent No. 6,128,078 of Fateley ("Fateley"); claims 5, 6, and 10 under §103(a), as being unpatentable over Fateley in view of U.S. Patent No. 6,504,943 of Sweatt et al.; and claim 11 was rejected under §103(a) as being unpatentable over Fateley in view of U.S. Patent No. 5,061,049 of Hornbeck. For the reasons stated below, Applicants assert that the foregoing rejected claims are allowable over the prior art of record, and that therefore all of claims 1-51 are allowable in their present form.

As discussed more fully and completely below, none of the prior art references or combinations suggested by the Examiner teaches an optical apparatus or method including all of the elements of Applicants' claimed inventions. Particularly, none of the prior art teaches an optical method or apparatus, which uses an array of **individually controllable** micromirrors to introduce dither modulation signals into **distinct spectral channels**, as recited in independent claims 1 and 47. Therefore, none of the prior art can anticipate nor render obvious any of the rejected claims.

Fateley

Fateley does not disclose nor suggest the novel optical apparatus of independent claim 1. Claim 1 requires an optical apparatus having an input port, providing a multi-wavelength optical signal, an output port, a wavelength-disperser that separates the optical signal into multiple

spectral channels, and an array of micromirrors that are **individually pivotable** provide distinct dither modulation signals in the multiple spectral channels.

Importantly, Fateley does not teach an apparatus that includes an array of micromirrors that are individually pivoted to introduce distinct dither modulation signals into unique spectral channels. Fateley teaches that modulation signals are introduced by wobbling entire rows or columns of micromirrors at the same time. That is, each of the micromirrors in Fateley is configured to be modulated together with all other micromirrors in its row or column. (Fateley at column 4, lines 9-11). For example, "the first row of mirrors may be wobbled at a modulation frequency of 100 Hz, the second row at 200 Hz, the third row at 300 Hz, etc." (Fateley at column 4, lines 12-14). As a result, the individual spectral channels in Fateley cannot be distinguished from one another by detecting the modulation signals. Instead, the modulation signals can only be used to generally indicate the row in which the spectral channel resides.

In contrast, Applicants optical apparatus allows distinct dither modulation signals to be introduced into **each spectral channel**. This advantageously allows each specific spectral channel to be **individually detected** solely based on its dither modulation signal. Applicants describe these advantages, for example, on page 19 of the pending application:

> The optical spectral monitoring apparatus **100** thus is capable of introducing distinct dither modulation signals in multiple spectral channels in a frequency-division-multiplexed fashion. **The distinct dither modulation signals enable the multiplexed spectral channels to be individually detected (e.g., by way of synchronous detection), whereby an optical power spectrum of the spectral channels can be derived. Such dither modulation signals may also be used as "identification markers" (or frequency tags) for identifying individual spectral channels in an optical networking application.** (Emphasis added).

Fateley fails to disclose an optical apparatus including micromirrors that are individually pivotable such that distinct dither modulation signals may be carried in each spectral channel. Since this element of claim 1 is completely missing from Fateley, claim 1 and all claims 1 – 6, 10-13 and 18 – 20 that depend from claim 1 are patentable over Fateley.

Claim 47 recites a method of spectral modulating and monitoring using a frequency-division-multiplexing scheme. Like claim 1, claim 47 requires that the micromirrors that are

individually pivotable such that the spectral channels carry **distinct** modulation signals. As set forth above, Fateley does not disclose or suggest introducing distinct modulation signals into each spectral channel. Rather, the micromirrors in Fateley are collectively modulated in groups, consisting of entire rows or columns of micromirrors. This is significantly different from Applicants' claimed invention, which allows each spectral channel to be individually identified based on its dither modulation signal. For at least these reasons, claim 47 and all claims 48 – 51, which depend from claim 47, are allowable over Fateley.

Sweatt and Fateley

The Examiner rejected claims 5, 6, and 10 as being unpatentable over Fateley in view Sweatt. As set forth above, Fateley does not disclose all of the recited elements of either independent claim 1 or 47. Namely, Fateley fails to disclose micromirrors that are individually pivotable to introduce distinct dither modulation signals into individual spectral channels. This element is also missing from Sweatt. Particularly, Sweatt does not teach modulating signals in the manner recited in Applicants' claimed invention. Rather, Sweatt teaches using **more than one mirror per spectral channel**, with some tilted to the "off" position and some tilted to the "on" position. (Sweatt at column 9, lines 44-49). This is fundamentally different from Applicants' claimed invention, where each spectral channel corresponds to a single micromirror that may be pivoted in such a manner as to introduce dither modulation signals into the corresponding spectral channel. Because Sweatt requires multiple micromirrors to perform modulation, any optical apparatus implementing the teachings of Sweatt would require at least twice as many micromirrors as Applicants' claimed invention to perform the same modulation. This would undesirably increase the cost and complexity of the optical apparatus. Because Sweatt fails to teach an optical apparatus that can provide modulation with a one-to-one ratio of micromirrors and spectral channels, it cannot anticipate nor render obvious Applicants' claimed invention.

For at least these reasons, Sweatt and Fateley cannot render obvious any of claims 5, 6 and 10.

Hornbeck and Fateley

The Examiner rejected claim 11 under as being unpatentable over Fateley in view of U.S. Patent No. 5,061,049 of Hornbeck. As set forth above, Fateley does not disclose all of the recited elements of either independent claim 1 or 47. Namely, Fateley fails to disclose

micromirrors that are individually pivotable to introduce distinct dither modulation signals into individual spectral channels. This element is also missing from Hornbeck. Hornbeck discloses only a light modulator (e.g., silicon machined micromirrors), and does not disclose or suggest how to modulate individual spectral signals to introduce distinct dither modulation signals into multiple spectral channels. Combining the silicon machined mirrors of Hornbeck with Fateley would result in the same drawbacks. That is, combining the mirrors of Hornbeck with the teachings of Fateley would simply result in silicon-machined micromirrors being operated in a "collective manner" as taught by Fateley. Thus, the combination would still fail to provide an optical system having multiple micromirrors that are individually pivoted to introduce distinct dither modulation signals into individual spectral channels.

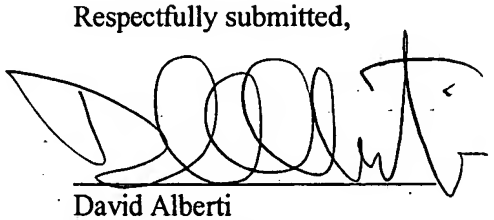
CONCLUSIONS

Applicants' invention is both novel and nonobvious over the prior art for the reasons set forth above. None of the prior art of record, either alone or in combination, teaches each and every element of Applicants' claimed invention.

For all of these reasons, Applicants respectfully assert that all of claims 1-51 are in condition for allowance. The Examiner's early reconsideration is respectfully requested. If the Examiner has any questions, the Examiner is invited to contact Applicants' attorney at the following address or telephone number:

David Alberti
c/o Patent Department
GRAY CARY WARE & FREIDENRICH LLP
1755 Embarcadero Road
Palo Alto, CA 94303
Telephone: (650) 833-2052

Respectfully submitted,



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David Alberti
Reg. No. 43,465

Appendix A

Claim 13 (amended, marked up version)

The optical apparatus of claim 1 further comprising a beam-focuser for focusing said spectral channels into corresponding focused spots that impinge onto said [beam-modulating elements] micromirrors.

Claim 18 (amended, marked up version)

The optical apparatus of claim 14 further comprising an alignment-adjusting element for adjusting an alignment between said spectral channels and said [beam-modulating elements] micromirrors.

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